

NOVEL MAN MACHINE INTERFACES AND APPLICATIONS

CROSS REFERENCES TO RELATED JOINT APPLICATIONS INCORPORATED BY REFERENCE

[0001] Provisional applications by Tim Pryor and Peter Smith

[0002] New man/machine interfaces and applications, filed Aug. 22, 1997 and

[0003] Novel Man machine interfaces and applications, filed Sep. 19, 1997 (docket number IV/PO5332USO)

[0004] Tim Pryor applications incorporated by reference herein

[0005] Man Machine Interfaces, filed Sep. 18, 1992 (Ser. No. 08/290,516)

[0006] Touch TV and other Man Machine Interfaces, filed 1995 (Ser. No. 08/496,908)

[0007] Systems for Occupant Position Sensing, Ser. No. 08/968,114

[0008] Vision Target based assembly, U.S. Ser. Nos. 08/469,429, 08/469,907, 08/470,325, 08/466,294

[0009] Federally sponsored R and D statement—not applicable

[0010] Microfiche Appendix—not applicable

BACKGROUND OF THE INVENTION

[0011] 1. Field of the Invention

[0012] The invention relates to simple input devices for computers, well suited for use with 3-D graphically intensive activities, and operating by optically sensing object or human positions and/or orientations. The invention in many preferred embodiments, uses real time stereo photogrammetry using single or multiple TV cameras whose output is analyzed and used as input to a personal computer.

[0013] 2. Description of Related Art

[0014] The closest known references to the stereo photogrammetric imaging of datum's employed by several preferred embodiments of the invention are thought to exist in the fields of flight simulation, robotics, animation and biomechanical studies. Some early prior art references in these fields are

[0015] U.S. patents

[0016] Pugh U.S. Pat. No.

[0017] Birk U.S. Pat. No. 4,416,924

[0018] Pinckney U.S. Pat. No. 4,219,847

[0019] U.S. Pat. No. 4,672,564 by Egli et al, filed Nov. 15, 1984

[0020] Pryor U.S. Pat. No. 5,506,682, robot vision using targets

[0021] Pryor, Method for Automatically Handling, Assembling & Working on Objects U.S. Pat. No. 4,654,949

[0022] Pryor, U.S. Pat. No. 5,148,591, Vision target based assembly

[0023] In what is called "virtual reality", a number of other devices have appeared for human instruction to a computer. Examples are head trackers, magnetic pickups on the human and the like, which have their counterpart in the invention herein.

[0024] References from this field having similar goals to some aspects of the invention herein are:

[0025] U.S. Pat. No. 5,297,061 by Dementhon et al

[0026] U.S. Pat. No. 5,388,059 also by Dementhon, et al

[0027] U.S. Pat. No. 5,168,531: Real-time recognition of pointing information from video, by Sigel

[0028] U.S. Pat. No. 5,617,312 Computer system that enters control information by means of video camera by Iura et al, filed Nov. 18, 1994

[0029] U.S. Pat. No. 5,616,078: Motion-controlled video entertainment system, by Oh; Ketsu,

[0030] U.S. Pat. No. 5,594,469: Hand gesture machine control system, by Feeman, et al.

[0031] U.S. Pat. No. 5,454,043: Dynamic and static hand gesture recognition through low-level image analysis by Freeman;

[0032] U.S. Pat. No. 5,581,276: 3D human interface apparatus using motion recognition based on dynamic image processing, by Cipolla et al.

[0033] U.S. Pat. No. 4,843,568: Real time perception of and response to the actions of an unencumbered participant/user by Krueger, et al

[0034] Iura and Sigel disclose means for using a video camera to look at a operators body or finger and input control information to a computer. Their disclosure is generally limited to two dimensional inputs in an xy plane, such as would be traveled by a mouse used conventionally.

[0035] Dementhon discloses the use objects equipped with 4 LEDs detected with a single video camera to provide a 6 degree of freedom solution of object position and orientation. He downplays the use of retroreflector targets for this task.

[0036] Cipolla et al discusses processing and recognition of movement sequence gesture inputs detected with a single video camera whereby objects or parts of humans equipped with four reflective targets or leds are moved thru space, and a sequence of images of the objects taken and processed. The targets can be colored to aid discrimination

[0037] Pryor, one of the inventors, in several previous applications has described single and dual (stereo) camera systems utilizing natural features of objects or special targets including retroreflectors for determination of position and orientation of objects in real time suitable for computer input, in up to 6 degrees of freedom

[0038] Pinckney has described a single camera method for using and detecting 4 reflective targets to determine position and orientation of an object in 6 degrees of freedom. A paper by Dr. H. F. L. Pinckney entitled Theory and Development